

Reality Labs Research (RLR)
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Dr. Michael Zollhöfer

Director, Research Scientist

I am working at Reality Labs Research (RLR) on the next generation of digital human capture and rendering for virtual and augmented reality.

Profile

Name Michael Zollhöfer
Gender male
Date of birth 28/07/1985
Place of birth Neustadt a.d. Aisch, Germany
Citizenship German
Languages German (native), English (fluent), Spanish (basic)

Research Statement

The primary goal of my research is to enable **fully immersive remote social interaction in the virtual world** at a level that is indistinguishable from reality. One fundamental aspect is photo-realistic digitization and efficient rendering to create 3D video streams of **digital humans**. I develop key technology that combines fundamental computer vision, machine learning, and graphics techniques in a **new neural capture and rendering paradigm**. I believe that these novel neural rendering techniques will bring immersive communication in virtual and augmented reality one step closer to reality, and thus completely **change the way we communicate in the future**.

Positions

- 03/2023 **Reality Labs Research (RLR), Meta (formerly known as Facebook Reality Labs).**
Director, Research Scientist
Reality Labs Research, Pittsburgh, PA, USA
- 09/2019 **Reality Labs Research (RLR), Meta (formerly known as Facebook Reality Labs).**
Research Scientist
Reality Labs Research, Pittsburgh, PA, USA
- 11/2017 **Stanford University.**
Visiting Assistant Professor
Host: Prof. Pat Hanrahan, Computer Graphics Laboratory, Stanford, CA, USA
- 02/2015 **Max Planck Institute for Informatics.**
Postdoctoral Researcher
Supervisor: Prof. Christian Theobalt, Graphics, Vision & Video Group, Saarbrücken, Germany
- 08/2013 **Microsoft Research Cambridge.**
Research Intern (3 months)
Host: Shahram Izadi, Interactive 3D Technologies (I3D), Cambridge, UK
- 2011 – 2014 **University of Erlangen-Nuremberg.**
Research Assistant
Supervisor: Prof. Günther Greiner, Computer Graphics Group, Erlangen, Germany
- 2010 **University of Erlangen-Nuremberg.**
Student Research Assistant
- 03/2009 **Eurographics Student Volunteer.**
Eurographics, Munich, Germany

Education

- 12/2014 **Completed PhD (summa cum laude).**
Thesis: "Real-Time Reconstruction of Static and Dynamic Scenes"
- 08/2014 **Research visit at Stanford University (3 months).**
Host: Assistant Prof. Matthias Nießner, Computer Graphics Group, Stanford, CA, USA
- 2011 – 2014 **PhD in Computer Science.**
Supervisor: Prof. Günther Greiner, Computer Graphics Group, Erlangen, Germany
- 09/2010 **Diploma with honors (Dipl.-Inf.).**
Comparable to M.Sc., Final Grade: 1.0 (best)
University of Erlangen-Nuremberg, Germany
- 08/2010 **Diploma Thesis.**
Topic: "Point Based Hierarchical Light Transport"
Comparable to Master Thesis, Grade 1.0 (best)
- 10/2007 **Intermediate Diploma in Computer Science, German "Vordiplom".**
University of Erlangen-Nuremberg, Germany
- 07/2007 **Student Research Project.**
Titel: "Shape Manipulation and Non-Rigid Registration using Embedded Deformations"
Comparable to Bachelor Thesis, Grade 1.0 (best)
- 2005 - 2010 **Studies of Computer Science, University of Erlangen-Nuremberg, Germany.**
 - Major Subjects: Computer Graphics, Operating Systems, Compilers
 - Minor Subject: Numerical Mathematics
- 05/2005 **University-Entrance Qualification, German "Abitur".**
- 1996 – 2005 **German High School.**
Gymnasium Herzogenaurach, Germany
- 1992 – 1996 **Elementary School.**
Grundschule Herzogenaurach, Germany

Awards

- 06/2020 **CVPR 2020 Best Student Paper Honorable Mention.**
DeepCap: Monocular Human Performance Capture Using Weak Supervision
- 12/2019 **NeurIPS 2019 Honorable Mention Outstanding New Directions Paper Award.**
Scene Representation Networks: Continuous 3D-Structure-Aware Neural Scene Representations
- 03/2019 **IEEE Virtual Reality Best Journal Paper Honorable Mention.**
Mo2Cap2: Real-time Mobile 3D Motion Capture with a Cap-mounted Fisheye Camera
- 06/2017 **MPC-VCC Fellowship.**
Postdoctoral fellowship of the Max Planck Center for Visual Computing and Communication
- 07/2016 **Best of Show Award at Emerging Technologies.**
Siggraph ETech 2016
- 10/2014 **EG GCH 2014 Best Paper Award.**
Graphics and Cultural Heritage 2014
- 02/2011 **ASQF-Sponsorship Award.**
Association for Software Quality and Further Education

Teaching

- Instructor **Stanford University.**
Graduate Seminar:
 - CS448V, Computational Video Manipulation (Spring 2019)
- Organizer **Max Planck Institute for Informatics.**
Seminar:
 - Computer Vision for Computer Graphics (Summer 2017)

- Teaching Assistant **Max Planck Institute for Informatics.**
Seminars:
- Computer Vision for Computer Graphics (Summer 2015, Summer 2016)
- Lecturer **University of Erlangen-Nuremberg.**
Course:
- Geometry Processing (Summer 2014)
- Teaching Assistant **University of Erlangen-Nuremberg.**
Courses:
- Geometry Processing (Summer 2012, Summer 2013)
 - Fundamentals of Computer Science (Winter 2011/12)
 - Algorithms of Continuous Systems (Summer 2011)
- Student Teaching Assistant **University of Erlangen-Nuremberg.**
Courses:
- Computer Graphics (Winter 2009/10, Winter 2010/11)
 - Algorithms of Continuous Systems (Summer 2010)
 - Algorithms and Data Structures (Winter 2007/08)

Advised Theses

- Master Theses **Max Planck Institute for Informatics.**
- “Template-based 3D Reconstruction of Non-rigid Surfaces from 4K RGB Video”, Marc Habermann
 - “Global Intrinsic Video Decomposition in Real-time”, Mohammad Shafiei
 - “Self-supervised Surface Reconstruction Using Floating Radial Basis Functions”, Hossein Hajipour
- Bachelor Theses **Max Planck Institute for Informatics.**
- “Data-Parallel Shading-based Refinement”, Max Augustin
- Research Immersion Labs **Max Planck Institute for Informatics.**
- “Material Estimation using Deep Learning”, Maxim Maximov
 - “Template-free Non-Rigid Reconstruction”, Edgar Tretschk
- Master Theses **University of Erlangen-Nuremberg.**
- “Real-Time Stereo Reconstruction using Scene Flow”, Lucas Thies
 - “Nesting Efficiency Feedback in a 3D Apparel Design Environment”, Matteo Colaiani
 - “Interactive Model-based Reconstruction of the Human Head”, Justus Thies
 - “Erlernen lokaler Härtegrade zur interaktiven Deformation von Dreiecksnetzen”, Andre Vieweg
 - “A Linear Surface Scanner for High Resolution Geometry”, Bert Riffelmacher
 - “Real-time 3D Scene Reconstruction from RGB-Data using Voxel Carving”, Matthias Innmann
 - “Global optimale Registrierung von 3D Messdaten”, Sabine Paris
- Bachelor Theses **University of Erlangen-Nuremberg.**
- “Feature based Camera Tracking for RGB-D Sensors”, Christian Liebelt
 - “Real-Time 3D-Stereo Reconstruction on GPUs”, Pascal Schön
 - “VARAP, Ein gitterbasiertes Verfahren zur effizienten Deformation von Dreiecksnetzen”, Ezgi Sert
 - “Echtzeit Kleidungssimulation”, Matteo Colaiani
 - “Example-Based Interactive Mesh Posing”, Eduard Rose
 - “Joint-Aware As-Rigid-As-Possible Surface Modeling”, Andre Vieweg
 - “Parallel Wavelet Reconstruction for 3D Objects”, Benjamin Steffes
 - “3D Echtzeit Rekonstruktion mittels des Kinect Tiefensensors”, Lucas Thies
 - “Real-Time Autonomous Collision Avoidance of a Quadrocopter”, Lukas Riedersberger
 - “Real-Time Autonomous Stabilization of a Quadrocopter”, Laura Lawniczak
 - “Übertragung von Deformationen zwischen Dreiecksnetzen”, Justus Thies
 - “Entwicklung eines geometrischen Blattmodells”, Sabine Paris

Programming Skills

- CPU **C++, C, Python, NumPy, Java, Scheme, Prolog.**
- GPU **CUDA, DirectX, HLSL, OpenGL, GLSL.**
- Deep Learning **PyTorch, TensorFlow, Keras, Caffe, cuDNN, Theano.**

Academic Services

Program Committee.

- CVPR (2021, 2020, 2018), PG (2019, 2018), HPG (2019, 2018), CVM (2019)
- FG (2017), EG STAR (2017), CAD/Graphics (2017)
- SGA Technical Briefs and Posters (2019)

Reviewing.

- Conferences:
 - CVPR (2021, 2020, 2018), ICCV (2015), ICRA (2018), 3DV (2019, 2018, 2017)
 - NeurIPS (2020), ICLR (2021)
 - Siggraph (2021, 2020, 2019, 2018, 2017), Siggraph Asia (2020, 2019, 2018, 2017, 2016)
 - EG (2020, 2019, 2017), EG STAR (2017), PG (2019, 2018), HPG (2019, 2018, 2015), CVM (2019)
 - FG (2017), CAD/Graphics (2017), PG (2017), GI (2016), TCI (2016)
- Journals:
 - TOG (2020, 2019, 2018, 2017, 2016), TVCG (2019, 2018, 2017, 2016), CGF (2016), CAVW (2018)
 - TPAMI (2020, 2019, 2018, 2017, 2016), IJCV (2018), Sensor (2018)

Chairing.

- Session Chair:
 - CVPR 2016

Tutorials, Workshops, and STAR Reports

- 08/2021 **Advances in Neural Rendering.**
Siggraph 2021 Course, Virtual
- 06/2021 **DynaVis: The 3rd International Workshop on Dynamic Scene Reconstruction.**
CVPR 2021 Workshop, Virtual
- 06/2020 **Neural Rendering.**
CVPR 2020 Tutorial, Seattle, WA, USA
- 06/2020 **DynaVis: The 2nd International Workshop on Dynamic Scene Reconstruction.**
CVPR 2020 Workshop, Seattle, WA, USA
- 05/2020 **State of the Art on Neural Rendering.**
Eurographics 2020, State-of-the-Art Reports Program, Norrköping, Sweden
- 06/2019 **DynaVis: The 1st International Workshop on Dynamic Scene Reconstruction.**
CVPR 2019 Workshop, Long Beach, CA, USA
- 09/2018 **Face Tracking and its Applications.**
ECCV 2018 Tutorial, Munich, Germany
- 04/2018 **State of the Art on 3D Reconstruction with RGB-D Cameras.**
Eurographics 2018, State-of-the-Art Reports Program, Delft, Netherlands
- 04/2018 **State of the Art on Monocular 3D Face Reconstruction, Tracking, and Applications.**
Eurographics 2018, State-of-the-Art Reports Program, Delft, Netherlands

Invited Talks

- 11/2019 **Neural Capture and Rendering.**
Facebook Reality Labs, Redmond, WA, USA
- 07/2019 **Neural (Re-)Rendering.**
Beijing Film Academy Round Table, Los Angeles, CA, USA
- 04/2019 **Real-time Reconstruction and Neural Rendering of Digital Humans.**
Industrial Light & Magic (ILM), San Francisco, CA, USA
- 03/2019 **2D and 3D Generative Models.**
Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Wadern, Germany
- 12/2018 **Is it real? Neural Reconstruction and Rendering of Virtual Humans.**
Facebook Reality Lab, Pittsburgh, PA, USA
- 11/2018 **Is it real? Facial Motion Capture and Reenactment using Deep Neural Networks.**
Graphics and Mixed Environment Seminar (GAMES), Webinar, China

- 10/2018 **Is it real? Deep Neural Face Reconstruction and Rendering.**
Stanford Center for Image Systems Engineering (SCIEN), Stanford, USA
- 10/2018 **Is it real? Neural Reconstruction and Rendering of Virtual Humans.**
Apple, Cupertino, CA, USA
- 09/2018 **Born in The Wild: Self-supervised 3D Face Model Learning.**
3D Reconstruction in the Wild, ECCV Workshop, Munich, Germany
- 09/2018 **An Overview of Face Editing Techniques.**
Workshop on Objectionable Content and Misinformation, ECCV Workshop, Munich, Germany
- 08/2018 **Real or Fake? – Deep Learning for Face Reconstruction and Video Editing.**
Facebook Reality Lab, Pittsburgh, PA, USA
- 08/2018 **Real or Fake? – Deep Learning for Face Reconstruction and Video Editing.**
BinaryVR, Burlingame, CA, USA
- 07/2018 **Real or Fake? – Deep Learning for Face Reconstruction and Video Editing.**
NVIDIA, Santa Clara, CA, USA
- 07/2018 **Real or Fake? – Deep Learning for Face Reconstruction and Video Editing.**
Google, San Francisco, CA, USA
- 06/2018 **Deep Learning and Optimization for Face Reconstruction and Video Editing.**
Intel Labs, Santa Clara, CA, USA
- 06/2018 **Manipulation of Faces in Videos.**
Convening on AI-manipulated Audio, Video and Images, Hewlett Foundation, Menlo Park, CA, USA
- 05/2018 **3D Computer Vision using Optimization and Deep Learning.**
Apple, Sunnyvale, CA, USA
- 05/2018 **3D Computer Vision using Optimization and Deep Learning.**
Oculus Research, Sausalito, CA, USA
- 04/2018 **3D Computer Vision using Optimization and Deep Learning.**
TU Braunschweig, Braunschweig, Germany
- 03/2018 **Inverse Graphics using Optimization and Deep Learning.**
Adobe Research, San Jose, CA, USA
- 02/2018 **3D and 4D Reconstruction using Deep Learning and Optimization.**
Meta, San Mateo, CA, USA
- 10/2017 **Capturing Reality Using Real-Time Optimization.**
PeopleCap: Capturing and Modeling Human Bodies, Faces and Hands,
ICCV 2017 Workshops, Venice, Italy
- 08/2017 **Real-time Deformable Reconstruction.**
USC Institute for Creative Technologies, Los Angeles, USA
- 07/2017 **Unsupervised Learning for Monocular Reconstruction.**
Doktorandenseminar Graphische Datenverarbeitung, Erlangen, Germany
- 06/2017 **Real-Time Reconstruction of our Physical World.**
BMVA Technical Meeting, Dynamic Scene Reconstruction, London, UK
- 04/2017 **Augmented Reality.**
IT Themenabend, DFKI Saarbrücken, Germany
- 07/2016 **Is it real? Capturing Human Body, Hand and Face Motion in the Wild.**
Tech Open Air (TOA), Berlin, Germany
- 12/2014 **Capturing Reality: Real-time Reconstruction of Static and Dynamic Objects.**
International Workshop on Computational Photography and Visual Computing, Shenzhen, China
- 07/2014 **Real-time Reconstruction of Static and Dynamic Objects.**
MPI Informatics, Saarbrücken, Germany

- [1] A. Božič, P. Palafox, **M. Zollhöfer**, A. Dai, J. Thies, and M. Nießner. Neural Non-Rigid Tracking. *Advances in Neural Information Processing Systems (NeurIPS 2020)*, 2020.
- [2] A. Božič, **M. Zollhöfer**, C. Theobalt, and M. Nießner. DeepDeform: Learning Non-rigid RGB-D Reconstruction with Semi-supervised Data. In *Proc. of Computer Vision and Pattern Recognition (CVPR 2020)*, IEEE, 2020.
- [3] A. Božič, P. Palafox, **M. Zollhöfer**, J. Thies, A. Dai, and M. Nießner. Neural Deformation Graphs for Globally-consistent Non-rigid Reconstruction. *Proc. Computer Vision and Pattern Recognition (CVPR 2021)*, 2021.
- [4] A. Dai, M. Nießner, **M. Zollhöfer**, S. Izadi, and C. Theobalt. BundleFusion: Real-time Globally Consistent 3D Reconstruction using On-the-fly Surface Re-integration. *ACM Transactions on Graphics (TOG) (SIGGRAPH 2017)*, 36(3), 2017.
- [5] Z. Devito, M. Mara, **M. Zollhöfer**, G. Bernstein, J. Ragan-Kelley, C. Theobalt, P. Hanrahan, M. Fisher, and M. Nießner. Opt: A Domain Specific Language for Non-Linear Least Squares Optimization in Graphics and Imaging. *ACM Transactions on Graphics (TOG) (SIGGRAPH 2018)*, 36(5), 2017.
- [6] B. Egger, W. A. P. Smith, A. Tewari, S. Wuhrer, **M. Zollhöfer**, T. Beeler, F. Bernard, T. Bolkart, A. Kortylewski, S. Romdhani, C. Theobalt, V. Blanz, and T. Vetter. 3D Morphable Face Models—Past, Present, and Future. *ACM Transactions on Graphics 2020 (TOG) (SIGGRAPH 2021)*, 2020.
- [7] O. Fried, A. Tewari, **M. Zollhöfer**, A. Finkelstein, E. Shechtman, D. B Goldman, K. Genova, Z. Jin, C. Theobalt, and M. Agrawala. Text-based Editing of Talking-head Video. *ACM Transactions on Graphics 2019 (TOG) (SIGGRAPH 2019)*, 38(4), 2019.
- [8] G. Gafni, J. Thies, **M. Zollhöfer**, and M. Nießner. Dynamic Neural Radiance Fields for Monocular 4D Facial Avatar Reconstruction. *Proc. Computer Vision and Pattern Recognition (CVPR 2021)*, 2021.
- [9] P. Garrido, **M. Zollhöfer**, D. Casas, L. Valgaerts, K. Varanasi, P. Perez, and C. Theobalt. Reconstruction of Personalized 3D Face Rigs from Monocular Video. *ACM Transactions on Graphics (TOG) (SIGGRAPH 2016)*, 35(3), 2016.
- [10] P. Garrido, **M. Zollhöfer**, C. Wu, D. Bradley, P. Pérez, T. Beeler, and C. Theobalt. Corrective 3D Reconstruction of Lips from Monocular Video. *ACM Transactions on Graphics (TOG) (SIGGRAPH ASIA 2016)*, 35(6), 2016.
- [11] M. Habermann, W. Xu, H. Rhodin, **M. Zollhöfer**, G. Pons-Moll, and C. Theobalt. NRST: Non-rigid Surface Tracking from Monocular Video. *German Conference on Pattern Recognition (GCPR 2018)*, pages 335–348, October 2018.
- [12] M. Habermann, W. Xu, **M. Zollhöfer**, G. Pons-Moll, and C. Theobalt. LiveCap: Real-time Human Performance Capture from Monocular Video. *ACM Transactions on Graphics (TOG) (SIGGRAPH 2019)*, 2019.
- [13] M. Habermann, W. Xu, **M. Zollhöfer**, G. Pons-Moll, and C. Theobalt. DeepCap: Monocular Human Performance Capture Using Weak Supervision. In *Proc. of Computer Vision and Pattern Recognition (CVPR 2020)*, IEEE, 2020.
- [14] M. Habermann, L. Liu, W. Xu, **M. Zollhöfer**, G. Pons-Moll, and C. Theobalt. Real-time Deep Dynamic Characters. *ACM Transactions on Graphics 2021 (TOG) (SIGGRAPH 2021)*, 2021.
- [15] M. Habermann, W. Xu, **M. Zollhöfer**, G. Pons-Moll, and C. Theobalt. A Deeper Look into DeepCap. In *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI 2021)*, 2021.
- [16] M. Innmann, **M. Zollhöfer**, M. Nießner, C. Theobalt, and M. Stamminger. VolumeDeform: Real-time Volumetric Non-rigid Reconstruction. In *Proceedings of European Conference on Computer Vision (ECCV 2016)*, 2016.
- [17] H. Kim, P. Garrido, A. Tewari, W. Xu, J. Thies, N. Nießner, P. Pérez, C. Richardt, **M. Zollhöfer**, and C. Theobalt. Deep Video Portraits. *ACM Transactions on Graphics 2018 (TOG) (SIGGRAPH 2018)*, 2018.
- [18] H. Kim, **M. Zollhöfer**, A. Tewari, J. Thies, C. Richardt, and Theobalt C. InverseFaceNet: Deep Single-Shot Inverse Face Rendering From A Single Image. In *Proc. Computer Vision and Pattern Recognition (CVPR 2018)*, IEEE, June 2018.

- [19] H. Kim, M. Elgharib, **M. Zollhöfer**, H.-P. Seidel, T. Beeler, C. Richardt, and C. Theobalt. Neural Style-Preserving Visual Dubbing. *ACM Transactions on Graphics 2019 (TOG) (SIGGRAPH ASIA 2019)*, 2019.
- [20] C. Lassner and **M. Zollhöfer**. Pulsar: Efficient Sphere-based Neural Rendering. *Proc. Computer Vision and Pattern Recognition (CVPR 2021)*, 2021.
- [21] T. Li, M. Slavcheva, **M. Zollhöfer**, S. Green, C. Lassner, C. Kim, T. Schmidt, S. Lovegrove, M. Goesele, and Z. Lv. Neural 3D Video Synthesis. *arXiv preprint (arXiv:2103.02597)*, 2021.
- [22] L. Liu, W. Xu, **M. Zollhöfer**, H. Kim, F. Bernard, M. Habermann, W. Wang, and C. Theobalt. Neural Animation and Reenactment of Human Actor Videos. *ACM Transactions on Graphics (TOG) (SIGGRAPH 2019)*, 2019.
- [23] L. Liu, W. Xu, M. Habermann, **M. Zollhöfer**, F. Bernard, H. Kim, W. Wang, and C. Theobalt. Neural Human Video Rendering by Learning Dynamic Textures and Rendering-to-Video Translation. *IEEE Transactions on Visualization and Computer Graphics (TVCG 2020)*, 2020.
- [24] S. Lombardi, T. Simon, G. Schwartz, **M. Zollhöfer**, Y. Sheikh, and J. Saragih. Mixture of Volumetric Primitives for Efficient Neural Rendering. *ACM Transactions on Graphics 2021 (TOG) (SIGGRAPH 2021)*, 2021.
- [25] M. Mara, F. Heide, **M. Zollhöfer**, M. Nießner, and P. Hanrahan. Thallo - Scheduling for High-Performance Large-scale Non-linear Least-Squares Solvers. *ACM Transactions on Graphics 2021 (TOG) (SIGGRAPH 2021)*, 2021.
- [26] A. Meka, **M. Zollhöfer**, C. Richardt, and C. Theobalt. Live Intrinsic Video. *ACM Transactions on Graphics (SIGGRAPH 2016)*, 35(4), 2016.
- [27] A. Meka, G. Fox, **M. Zollhöfer**, C. Richardt, and C. Theobalt. Live User-Guided Intrinsic Video For Static Scenes. *IEEE Transactions on Visualization and Computer Graphics (TVCG) (ISMAR 2017)*, PP(99), 2017.
- [28] A. Meka, M. Maximov, **M. Zollhöfer**, A. Chatterjee, H.-P. Seidel, C. Richardt, and C. Theobalt. LIME: Live Intrinsic Material Estimation. In *Proc. Computer Vision and Pattern Recognition (CVPR 2018)*, IEEE, June 2018.
- [29] A. Meka, C. Haene, R. Pandey, **M. Zollhöfer**, S. Fanello, G. Fyffe, A. Kowdle, X. Yu, J. Busch, J. Dourgarian, P. Denny, S. Bouaziz, P. Lincoln, M. Whalen, G. Harvey, J. Taylor, S. Izadi, A. Tagliasacchi, P. Debevec, C. Theobalt, J. Valentin, and C. Rhemann. Deep Reflectance Fields - High-Quality Facial Reflectance Field Inference From Color Gradient Illumination. *ACM Transactions on Graphics 2019 (TOG) (SIGGRAPH 2019)*, 38(4), 2019.
- [30] A. Meka, M. Shafiei, **M. Zollhöfer**, C. Richardt, and C. Theobalt. Real-time Global Illumination Decomposition of Videos. *ACM Transactions on Graphics 2021 (TOG) (SIGGRAPH 2021)*, 2021.
- [31] M. Nießner, **M. Zollhöfer**, S. Izadi, and M. Stamminger. Real-time 3D Reconstruction at Scale using Voxel Hashing. *ACM Transactions on Graphics (TOG) (SIGGRAPH ASIA 2013)*, 2013.
- [32] A. Raj, **M. Zollhöfer**, T. Simon, J. Saragih, S. Saito, J. Hays, and S. Lombardi. PVA: Pixel-aligned Volumetric Avatars. *Proc. Computer Vision and Pattern Recognition (CVPR 2021)*, 2021.
- [33] A. Richard, **M. Zollhöfer**, Y. Wen, F. De la Torre, and Y. Sheikh. MeshTalk: 3D Face Animation from Speech using Cross-Modality Disentanglement. In *IEEE International Conference on Computer Vision (ICCV 2021)*, 2021.
- [34] C. Siegl, M. Colaianni, L. Thies, J. Thies, **M. Zollhöfer**, S. Izadi, M. Stamminger, and F. Bauer. Real-time Pixel Luminance Optimization for Dynamic Multi-Projection Mapping. *ACM Transactions on Graphics (TOG) (SIGGRAPH ASIA 2015)*, 34(6), 2015.
- [35] V. Sitzmann, J. Thies, F. Heide, M. Nießner, G. Wetzstein, and **M. Zollhöfer**. DeepVoxels: Learning Persistent 3D Feature Embeddings. In *Proc. of Computer Vision and Pattern Recognition (CVPR 2019)*, IEEE, 2019.
- [36] V. Sitzmann, **M. Zollhöfer**, and G. Wetzstein. Scene Representation Networks: Continuous 3D-Structure-Aware Neural Scene Representations. In *Advances in Neural Information Processing Systems (NeurIPS 2019)*, 2019.

- [37] S. Sridhar, F. Mueller, **M. Zollhöfer**, D. Casas, A. Oulasvirta, and C. Theobalt. Real-time Joint Tracking of a Hand Manipulating an Object from RGB-D Input. In *Proceedings of European Conference on Computer Vision (ECCV 2016)*, 2016.
- [38] S.-Y. Su, F. Yu, **M. Zollhöfer**, and H. Rhodin. A-NeRF: Surface-free Human 3D Pose Refinement via Neural Rendering. *arXiv preprint (arXiv:2102.06199)*, 2021.
- [39] J. Süßmuth, **M. Zollhöfer**, and G. Greiner. Animation Transplantation. *Computer Animation and Virtual Worlds (CASA 2010)*, 21(3-4):173–182, 2010.
- [40] A. Tewari, **M. Zollhöfer**, H. Kim, P. Garrido, F. Bernard, P. Perez, and C. Theobalt. MoFA: Model-based Deep Convolutional Face Autoencoder for Unsupervised Monocular Reconstruction. In *The IEEE International Conference on Computer Vision (ICCV 2017)*, 2017.
- [41] A. Tewari, **M. Zollhöfer**, F. Bernard, P. Garrido, H. Kim, P. Pérez, and C. Theobalt. High-Fidelity Monocular Face Reconstruction based on an Unsupervised Model-based Face Autoencoder. In *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI 2018)*, 2018.
- [42] A. Tewari, **M. Zollhöfer**, P. Garrido, F. Bernard, H. Kim, P. Pérez, and C. Theobalt. Self-supervised Multi-level Face Model Learning for Monocular Reconstruction at over 250 Hz. In *Proc. Computer Vision and Pattern Recognition (CVPR 2018)*, IEEE, June 2018.
- [43] A. Tewari, F. Bernard, P. Garrido, G. Bharaj, M. Elgharib, H.-P. Seidel, P. Pérez, **M. Zollhöfer**, and C. Theobalt. FML: Face Model Learning from Videos. In *Proc. of Computer Vision and Pattern Recognition (CVPR 2019)*, IEEE, 2019.
- [44] A. Tewari, M. Elgharib, G. Bharaj, F. Bernard, H.-P. Seidel, P. Pérez, **M. Zollhöfer**, and C. Theobalt. StyleRig: Rigging StyleGAN for 3D Control over Portrait Images. In *Proc. of Computer Vision and Pattern Recognition (CVPR 2020)*, IEEE, 2020.
- [45] A. Tewari, M. Elgharib, M. BR, F. Bernard, H.-P. Seidel, P. Pérez, **M. Zollhöfer**, and C. Theobalt. PIE: Portrait Image Embedding for Semantic Control. *ACM Transactions on Graphics (SIGGRAPH ASIA 2020)*, 2020.
- [46] A. Tewari, O. Fried, J. Thies, V. Sitzmann, S. Lombardi, K. Sunkavalli, R. Martin-Brualla, T. Simon, J. Saragih, M. Nießner, R. Pandey, S. Fanello, G. Wetzstein, J.-Y. Zhu, C. Theobalt, M. Agrawala, E. Shechtman, D. B. Goldman, and **M. Zollhöfer**. State of the Art on Neural Rendering. *Computer Graphics Forum (EG STAR 2020)*, 2020.
- [47] J. Thies, **M. Zollhöfer**, M. Nießner, L. Valgaerts, M. Stamminger, and C. Theobalt. Real-time Expression Transfer for Facial Reenactment. *ACM Transactions on Graphics (TOG) (SIGGRAPH ASIA 2015)*, 34(6), 2015.
- [48] J. Thies, **M. Zollhöfer**, M. Stamminger, C. Theobalt, and M. Nießner. Face2Face: Real-time Face Capture and Reenactment of RGB Videos. In *Proc. Computer Vision and Pattern Recognition (CVPR 2016)*, IEEE, 2016.
- [49] J. Thies, **M. Zollhöfer**, M. Stamminger, C. Theobalt, and M. Nießner. Face2Face: Real-time Face Capture and Reenactment of RGB Videos. *Communications of the ACM (CACM 2019)*, 62(1):96–104, December 2018. ISSN 0001-0782.
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